

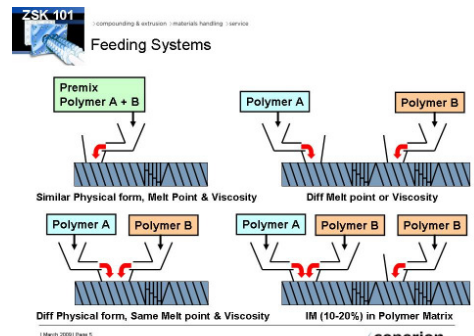
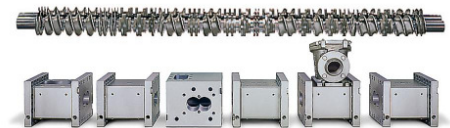
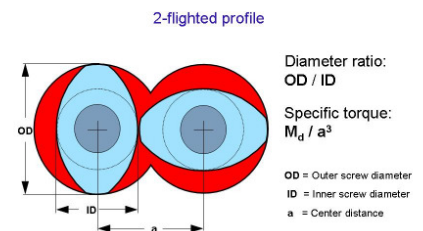
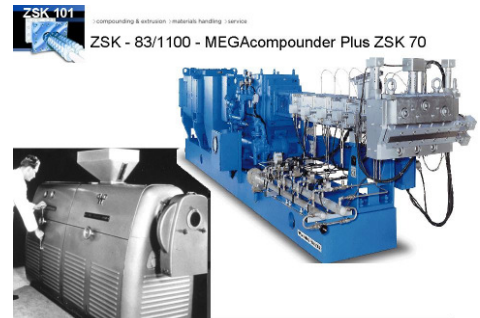


ZSK 101 COURSE OUTLINE

ZSK TWIN SCREW EXTRUSION COMPOUNDING SYSTEM

DAY 1:

- I. INTRODUCTION
- II. ZSK DESIGN CHARACTERISTICS
 - A. Historical Background
 1. Applications of Twin Screw
 2. Different ZSK Generations
 - B. Definitions
 1. Outer & Inner Diameter
 2. Torque
 3. Shear Rates
 4. Free Volume
 - C. Basic Machine Components
 1. Screw Bushings
 2. Kneading Blocks
 3. Special Elements
 - a. SK/SF
 - b. Distributive Mixing Elements
 - c. 3-lobe KB
 4. Barrels
 5. Vents
 - D. Pelletizer Options
- III. FEEDERS AND FEED HANDLING SYSTEMS
- IV. UNIT OPERATIONS Part 1
 - A. Feed Handling/Preparation
 - B. Feeding
 1. Upstream Feeding
 2. Downstream Feeding
 - a. Solids
 - b. Liquids
 - C. Plastification
 1. Conductive/Convective
 2. Shear Dissipation





ZSK 101 COURSE OUTLINE

DAY 2:

- V. **UNIT OPERATIONS Part 2**
 - D. **Mixing**
 - E. **Devolatilization/Degassing**
 - F. **Metering/Pressure Generation**
 - G. **Discharge**
 - 1. **Pelletizing Train**
 - 2. **Direct Extrusion**

- VI. **PROCESS CONTROLS & INTERLOCKS**
 - A. **System Scope**
 - B. **Design**
 - C. **Safety Interlock System**

- VII. **EXAMPLES OF PROCESS SYSTEMS**
 - A. **Compounding**
 - 1. **Dispersive**
 - 2. **Distributive**
 - B. **Devolatilization**

- VIII. **SCALE-UP FACTORS FOR ZSK MACHINES**
 - A. **Machine Series Geometry Difference**
 - B. **Basis for Scale-up Method Selection**
 - C. **Volumetric Scale-up - Degree of Fill**
 - D. **Alternate Method to Scale Throughput:
Specific Mechanical Energy**
 - E. **Scaling Shear Rate for ZSK Extruders**
 - F. **Scale-up for Heat Transfer**

- IX. **LABORATORY, ASSEMBLY & OPERATION**

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Mixing Functions

Distributive

Dispersive

1 March 2009 Page 6

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Interlocks

Engine Start Interlocks

- Handbrake Kill Switch in Run Position
- Ignition Key on
- Bike not in Gear or Clutch depressed and Kill Switch in Up Position
- Starter Button Depressed

gear Interlocks

- Kickstand in Up Position

1 March 2009 Page 7

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Liquid - Liquid Mixing

Percent Anti-Stat as a Function of Mixing Configuration

Mixing Configuration	% Anti-Stat
Configuration 1	~15%
Configuration 2	~18%
Configuration 3	~22%
Configuration 4	~25%

1 March 2009 Page 8

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Relative X-Sectional Area: ZSK 58 vs. ZSK 320

1 March 2009 Page 9



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DAY 3:

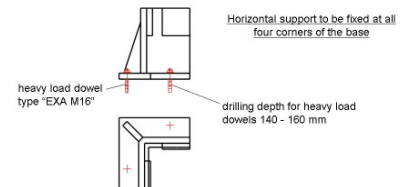
- X. TROUBLE SHOOTING THE PROCESS

- XI. MAINTENANCE OVERVIEW
 - A. Maintenance Manuals
 - B. Spare Parts

- XII. EXTRUDER WEAR/MATERIAL OF CONSTRUCTION
 - A. Types of Wear
 - B. Wear Reduction/Process Related Minimization
 - C. Wear Reduction/Special Materials of Construction



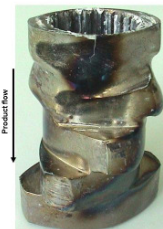
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Installation of the Machine



1 March 2009 Page 10



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Excessive wear due to abrasive materials



1 March 2009 Page 11